



DEEP-SEA SHRIMPS OF THE GENUS *GLYPHOCRANGON* A. MILNE-EDWARDS
(CRUSTACEA, DECAPODA, CARIDEA, GLYPHOCRANGONIDAE)
FROM OFF SOUTHEASTERN COAST OF BRAZIL
COLLECTED DURING THE REVIZEE PROGRAM¹

(With 4 figures)

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ABSTRACT: This paper reports on species of the deep-water shrimp genus *Glyphocrangon* A. Milne-Edwards, 1881 collected during Revizee Program in 1999 and 2000 from southwestern Atlantic off Brazil (ranging from 12°S to 21°S) conducted by R/V "Thalassa". The collection is represented by the following eight species: *G. aculeata* A. Milne Edwards, 1881; *G. alispina* Chace, 1939; *G. aurantiaca* Holthuis, 1971; *G. longirostris* (Smith, 1882); *G. neglecta* Faxon, 1896; *G. nobilis* A. Milne Edwards, 1881; *G. sculpta* (Smith, 1882); and *G. spinicauda* A. Milne-Edwards, 1881. The four species, *G. aurantiaca*, *G. longirostris*, *G. nobilis* and *G. sculpta* are recorded from the southwestern Atlantic (southeast Brazil) for the first time, with considerable range extensions to south. Brief diagnoses are given for the species.

Key words: Crustacea; Decapoda; Caridea; Glyphocrangonidae; *Glyphocrangon*; new records; Brazil.

RESUMO: Camarões de mar profundo do gênero *Glyphocrangon* A. Milne-Edwards (Crustacea, Decapoda, Caridea, Glyphocrangonidae) coletados ao largo do sudeste do Brasil durante o Programa Revizee.

Este trabalho registra as espécies de camarão de mar profundo do gênero *Glyphocrangon* A. Milne-Edwards, 1881, coletados durante o Programa Revizee em 1999 e 2000 no sudoeste do Atlântico, ao largo do Brasil (de 12°S a 21°S) realizado pelo N/O. "Thalassa". A coleção é representada por oito espécies: *G. aculeata* A. Milne Edwards, 1881; *G. alispina* Chace, 1939; *G. aurantiaca* Holthuis, 1971; *G. longirostris* (Smith, 1882); *G. neglecta* Faxon, 1896; *G. nobilis* A. Milne Edwards, 1881; *G. sculpta* (Smith, 1882); and *G. spinicauda* A. Milne-Edwards, 1881. Quatro espécies, *G. aurantiaca*, *G. longirostris*, *G. nobilis* and *G. sculpta*, são registradas pela primeira vez para o Atlântico sudoeste (sudeste do Brasil), com significativas extensões de distribuição meridional. Breves diagnoses são apresentadas para as espécies.

Palavras-chave: Crustacea; Decapoda; Caridea; Glyphocrangonidae; *Glyphocrangon*; novos registros; Brasil.

INTRODUCTION

Knowledge on deep-water decapod crustaceans in the southwestern Atlantic off Brazil has been enriched by recent studies (M.TAVARES, 1998, 1999a, 1999b; C.TAVARES & YOUNG, 2002; RODRIGUES & YOUNG, 2003), although the inventory of the fauna is still far from complete. This paper deals with a collection of deep-water shrimps of the genus *Glyphocrangon* A. Milne-Edwards, 1881, taken from the southwestern Atlantic during the Revizee Program of the Brazilian government in 1999 and 2000. This program was carried out in the purpose of making a census of fisheries resources on the continental shelf and slope off the Brazilian coast. During the trawling survey conducted by the R/V "Thalassa," a total of 69 benthic stations were investigated (10 stations between 19°S to 21°S at depth of 518 to 910m in 1999, and 59 stations between 13°S and 21°S, at depths of 233 to 2271m

in 2000). The study of the extensive material produced by this program has revealed the existence of eight species of *Glyphocrangon* A. Milne-Edwards, 1881, of which four species are recorded from Brazil for the first time: *G. aurantiaca* Holthuis, 1971, *G. longirostris* (Smith 1882), *G. nobilis* A. Milne Edwards, 1881, and *G. sculpta* (Smith, 1882). In this paper, brief diagnoses facilitating the identification and taxonomic notes are provided for the species.

MATERIAL AND METHODS

Material examined in this study is deposited in the collection of the Museu Nacional - Rio de Janeiro (MNRJ). Supplemental specimens housed in the Nationaal Natuurhistorisch Museum, Leiden, the Netherlands (previously Rijksmuseum van Natuurlijke Historie - RMNH), were also examined for comparison. The terminology generally follows

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KOMAI (in press). Carapace length (cl) represents specimen size, measured from the posterior margin of the orbit to the midpoint of the posterior margin of the carapace. Synonymies are not intended to be complete, as HOLTHUIS (1971) published an excellent review of the Atlantic species of *Glyphocrangon*. They are restricted to the original references, synonyms, most significant works accompanied with illustrations and those providing information on distribution.

TAXONOMIC ACCOUNT

Glyphocrangon aculeata A.Milne Edwards, 1881
(Fig.1A, B)

Glyphocrangon aculeatum A.Milne Edwards, 1881:5
(type locality: off St.Vincent, West Indies, 1030m); 1883. pl.39.

Rhacocaris agassizii Smith, 1882:43, pl.5, fig.2,
pl.6, fig.2 (type locality: south of Cape Hatteras,
North Carolina, 33°42.15'N, 76°00.50'W, 835m).

Glyphocrangon aculeata - BATE, 1888:521, pl.94,
fig.1; MOREIRA, 1901:15; PEQUEGNAT,
1970:104; HOLTHUIS, 1971:323, fig.10;
COELHO & RAMOS, 1972:156; BOSCHI,
1973:234, fig.1b; FOREST & HOLTHUIS,
1997:56; RAMOS-PORTO & COELHO, 1998:342.

Material examined – R/V “Thalassa”: stn D-503,
19°39.943'S, 38°38.435'W, 808m, 20/VI/1999, 1♀
23.4mm, 3 ovig. 29.1-29.4mm (MNRJ 13740); stn
D-0504, 19°42.734'S, 28°36.472'W, 910m, 29/VI/
1999, 1♀ 21.9mm, 1 ovig. 32.0mm (MNRJ 13741);
stn D-0506, 19°42.734'S, 38°36.472'W, 910m, 29/
VI/1999, 2♂ 18.0, 20.9mm, 1 ovig. 31.7mm (MNRJ
13743); stn E-0496, 13°17.580'S, 38°17.599'W,
1717m, 07/VI/2000, 1♀ 21.0mm (MNRJ 14928);
stn E-0497, 13°13.841'S, 38°19.525'W, 1374m,
07/VI/2000, 1♂ (crashed), 2♀ (damaged) (MNRJ
14931); stn E-0499, 13°23.826'S, 38°37.541'W,
761m, 08/VI/2000, 1♀ 25.1mm, 13 ovig. 23.6-
28.3mm (MNRJ 14921); stn E-0501, 14°13.986'S,
38°40.277'W, 1654m, 09/VI/2000, 1♀ 20.1mm,
3 ovig. 25.7-26.5mm (MNRJ 14932); stn E-0503,
14°34.565'S, 38°52.029'W, 740m, 10/VI/2000, 3
ovig. 22.1-25.2mm (MNRJ 14934); stn E-0505,
14°36.606'S, 38°49.345'W, 1089m, 10/VI/2000,
1♂ 17.6mm (MNRJ 14933); stn E-0506,
14°36.579'S, 38°49.544'W, 1067m, 10/VI/2000,
10♂ 18.2-20.9mm, 1♀ 17.2mm (MNRJ 14918);
stn E-0507, 15°08.595'S, 38°40.638'W, 1026m,
11/VI/2000, 3♂ 12.6-20.1mm, 1♀ 17.9mm, 3

ovig. 24.7-28.7mm, 1 juv. 11.6mm (MNRJ 14924);
stn E-517, 13°22.173'S, 38°36.566'W, 750m, 19/
VI/2000, 3♀ 26.6-29.8mm, 4 ovig. 25.0-29.2mm
(MNRJ 14919); stn E-522, 13°30.495'S,
38°38.977'W, 1144m, 21/VI/2000, 26♂ 17.4-
21.4mm, 4♀ 14.2-26.1mm, 1 ovig. 25.0mm (MNRJ
14920); stn E-523, 19°42.685'S, 38°32.030'W,
922m, 27/VI/2000, 2♂ 19.7, 20.6mm, 2♀ 21.5,
27.9mm, 1 ovig. 27.3mm (MNRJ 14923); same
data, 1 ovig. 33.8mm (MNRJ 14887); stn E-524,
19°43.663'S, 38°39.838'W, 925m, 27/VI/2000, 1♂
24.4mm, 2 ovig. 30.3, 31.2mm (MNRJ 14926); stn
E-527, 19°50.736'S, 39°10.817'W, 1402m, 29/VI/
2000, 1♀ 22.8mm (MNRJ 14925); stn E-528,
19°45.258'S, 39°03.003'W, 1237m, 29/VI/2000,
1♀ 25.2mm (MNRJ 14929); stn E-535,
19°58.936'S, 39°38.657'W, 1002m, 01/VII/2000,
1♂ 20.2mm (MNRJ 14930); stn E-547,
21°46.569'S, 39°53.364'W, 1105m, 06/VII/2000,
1♂ 17.8mm, 3♀ 12.2-22.6mm (MNRJ 14922); stn
E-551, 21°07.780'S, 39°49.106'W, 1642m, 08/VII/
2000, 1♂ 18.1mm (MNRJ 14917).

Supplemental specimens – “Pillsbury”: stn 741,
Caribbean Sea off Venezuela, 11°47.8'N,
66°06.8'W, 1051-1066m, 23/VII/1968, 4♂
19.9-23.5mm, 2♀ 23.9, 25.2mm, 1 ovig.
31.7mm (RMNH 25467).

Diagnosis – Carapace and abdomen naked.
Rostrum shorter than carapace in adult, with 2
pairs of lateral spines; dorsal surface lacking
corrugation or transverse septa. Carapace with first
(submedian) carina composed of relatively high,
laterally compressed, sharp tubercles; anteriormost
tubercle of anterior second (intermediate) carina
spiniform; anterior third (antennal) carina short,
not extending to hepatic region; posterior third
(antennal) carina terminating anteriorly in strong
tooth; anterior fourth (lateral) carina forming large,
vertically compressed, acute lamina; antennal spine
long, slender, few small tubercles on median and
branchial regions. Abdomen with high median
carinae; dorsolateral carinae and tergal and pleural
tubercles conspicuous. Eye moderately large
(maximal diameter 0.20-0.23 of carapace length),
darkly pigmented in adult. Dactyli of fourth and
fifth pereopod subspatulate, acuminate.

Variations – Possible sexual dimorphism is found
in the development of the acute lamina of the
anterior fourth carina and ornamentation of the
abdomen. The acute lamina of the fourth anterior
carina is more slender and more strongly produced
in males than in females. The tooth-like median

carinae on the first and second abdominal somites are more strongly erect in females than in males. The posterior section of the median carina on the fifth abdominal somite is produced in an acute tooth in females, while it is lower and not produced posteriorly in males. The tergal and pleural tubercles on the abdomen are more developed in females than in males.

Distribution – This species has been recorded from off Cape Hatteras (North Carolina, U.S.A.) to off Recife (northeastern Brazil), and from the entire Gulf of Mexico and Caribbean; at depths of 707-1760m (HOLTHUIS, 1971). The previous record from Brazilian waters was made by BATE (1888) from off Recife at a depth of 1215m.

Remarks – The specimens from off Brazil agree very well with the detailed description by HOLTHUIS (1971) and supplemental specimens from off Venezuela used by HOLTHUIS (1971). The ovigerous female from “Thalassa” station E-523 has a distally bidentate, right, acute lamina of the anterior fourth carina. This abnormality is perhaps due to injury and regeneration.

This species is referable to the *G. regalis* species complex (KOMAI, in press) because of the anterior fourth carina on the carapace forming a vertically compressed, acute lamina, naked body integument and flat ventral surface of the rostrum. These characters immediately distinguish *G. aculeata* from the other Atlantic representatives of the genus. In the lack of transverse septa on the dorsal surface of the rostrum and the possession of only a few intercarinal tubercles on the carapace, this species is similar to *G. wagini* Burukovsky, 1990 known from Sala-y-Gomez Ridge in the southeastern Pacific. However, the shape of the antennal scaphocerite of *G. aculeata* is characteristic among the *G. regalis* species complex. The distal part of the scaphocerite tapers distally in *G. aculeata*, while in the other members of the *G. regalis* species complex the distal part of the scaphocerite is broadly rounded. Further, the stronger anterior tooth of the posterior third carina and the straight acute lamina of the anterior fourth carina distinguish *G. aculeata* from *G. wagini*.

Glyphocrangon alispina Chace, 1939
(Fig. 1C, D)

Glyphocrangon alispina Chace, 1939:39 (north of Matanzas Province, Cuba, 23°24'N, 81°00.5'W); PEQUEGNAT, 1970:105; HOLTHUIS, 1971:347, fig.15.

Material examined – R/V “Thalassa”: stn E-499, 13°23.826'S, 38°37.541'W, 761m, 8/VI/2000, 3♀ 11.9-14.1mm, 14 ovig. 16.0-18.8mm (MNRJ 18917); stn E-503, 14°37.834'S, 38°52.029'W, 740m, 10/VI/2000, 5♂ 11.0-13.2mm, 2♀ 9.9-14.0mm, 16 ovig. 15.7-19.6mm (MNRJ 14910); stn E-517, 13°22.173'S, 38°36.566'W, 750m, 19/VI/2000, 5♀ 11.0-13.6mm, 21 ovig. 15.4-19.0mm, 3 juv. 9.6-9.8mm (MNRJ 18918); stn E-518, 13°21.199'S, 38°39.782'W, 518m, 19/VI/2000, 1 ovig. 17.4mm (MNRJ 14927).

Supplemental specimens – “Pillsbury”: stn 413, Caribbean Sea off Colombia, 09°01.5'N, 76°53.0'W, 1267-952m, 18/VII/1966, 3♂ 13.2-14.5mm, 5 ovig. 13.7-16.2mm (RMNH 25258).

Diagnosis – Carapace and abdomen covered with short, dense pubescence. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface without transverse septa or corrugation. Carapace with first (submedian) carina composed of low, but acute tubercles; anteriormost tubercle of anterior second (intermediate) carina spiniform; anterior third (antennal) carina short, not extending to hepatic region; posterior third carina terminating anteriorly in small spine or low, right angle; anterior fourth (lateral) carina not expanded, nearly aligned with anterior third carina, terminating in small spine far remote from anterolateral margin of carapace; antennal spine very strong, vertically compressed, usually far more strongly divergent than branchiostegal spine; no conspicuous intercarinal tubercles on median and branchial regions. Abdomen with low, broad median carinae; dorsolateral carinae also low: tergal and pleural tubercles few, obsolete. Eye large (maximal diameter 0.28-0.30 of carapace length), darkly pigmented. Dactyli of fourth and fifth pereopods subspatulate, 0.60-0.70 times as long as propodus in fourth, 0.50-0.60 in fifth.

Variations – The development of the carinae on the carapace and abdomen is generally similar between males and females in this species.

Distribution – This species has been recorded from the entire Caribbean area, including the Gulf of Mexico, from the Florida Straits to British Guiana; at depths of 548-1865m (HOLTHUIS, 1971). MUNIZ *et al.* (2002) mentioned the occurrence of this species in Brazilian waters. This study confirms the occurrence of *G. alispina* in Brazil and extends the geographical range southward to 14°37.8'S.

Remarks – This species is very similar to the sympatric *G. nobilis*. HOLTHUIS (1971) used the direction of the antennal spine and armature of the posterior third (antennal) carina as key characters in distinguishing the two species. However, it has been found that these characters are variable in either species and thus they are not reliable. The antennal spine of *G. nobilis* is

sometimes divergent, approaching the condition shown by *G. alispina*. The armature of the posterior third carina is quite variable in the two species, from terminating in a low right angle to terminating in a small spine. Nevertheless, the size of the eye and length of the dactyli of the fourth and fifth pereopods serve to distinguish the two species. The eyes are larger in *G. alispina*

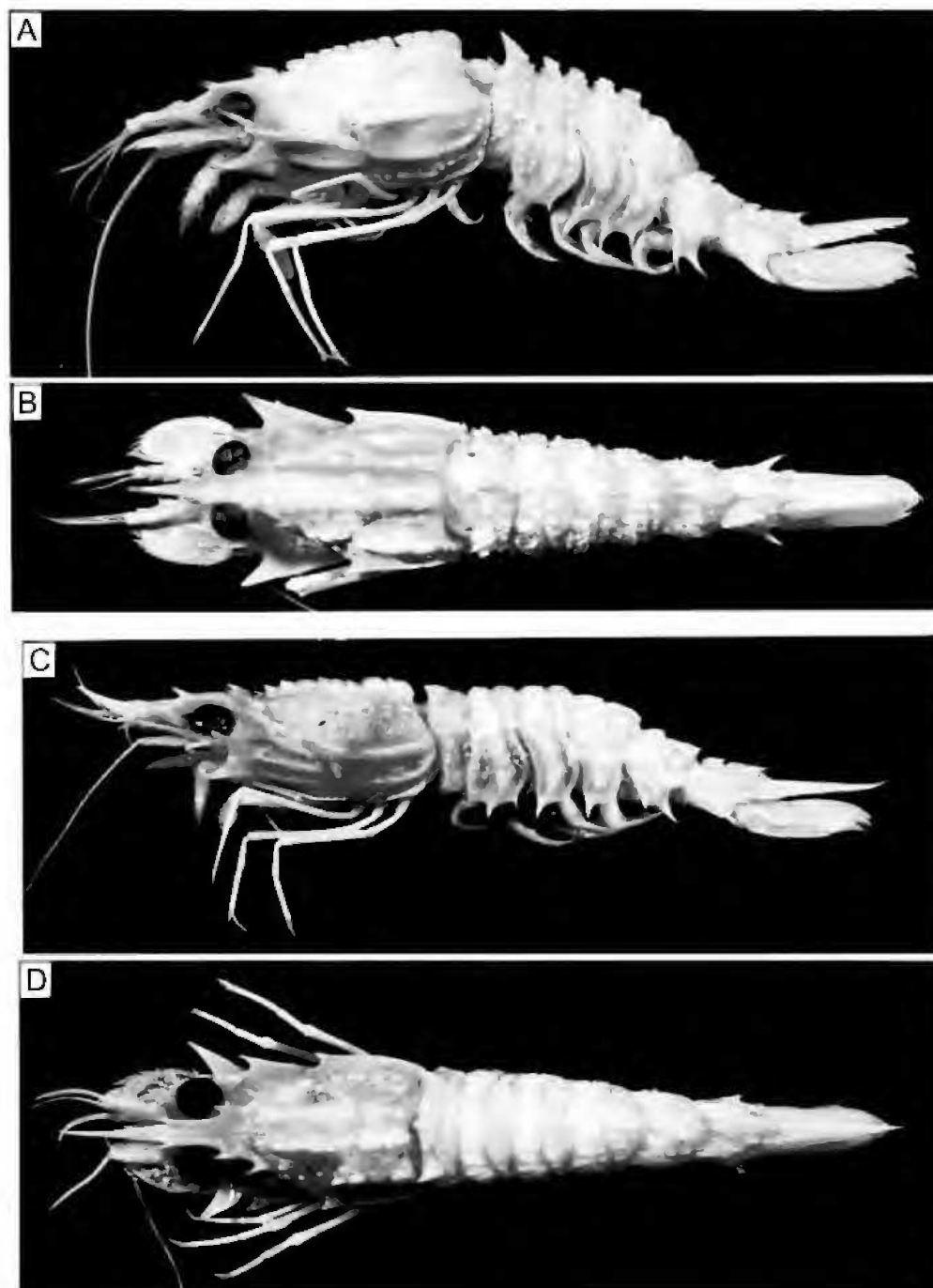


Fig.1- (A, B) *Glyphocrangon aculeata* A. Milne-Edwards, 1881, habitus (lateral and dorsal views), ovigerous female (cl 28.0mm; MNRJ 14924); (C, D) *Glyphocrangon alispina* Chace, 1939, habitus (lateral and dorsal views), ovigerous female (cl 17.4mm; MNRJ 14927).

than in *G. nobilis* (maximal diameter 0.28-0.30 of carapace length versus 0.20-0.23). The dactyli of the fourth and fifth pereopods are more elongate in *G. alispina* than in *G. nobilis* (0.40-0.50 times as long as propodus versus 0.60-0.70 as long in fourth pereopod, 0.30-0.40 versus 0.50-0.60 in fifth).

Glyphocrangon aurantiaca Holthuis, 1971
(Fig. 2A, B)

Glyphocrangon aurantiaca Holthuis, 1971:303, fig. 8 (type-locality: Caribbean Sea off Tobago, 11°37.3'N, 60°59.4'W, 720-1260m); Takeda and Okutani, 1983:68, unnumbered fig.

Material examined – R/V “Thalassa”: stn D-464, 21°48.496'S, 40°01.539'W, 592-618m, 22/VI/1999, 1 ovig. 25.8mm (MNRJ 13742); stn E-499, 13°23.826'S, 38°37.541'W, 761m, 8/VI/2000, 2♂ 18.5, 19.5mm (MNRJ 14896); stn E-500, 13°22.057'S, 38°40.204'W, 394m, 8/VI/2000, 1♀ 12.7mm (MNRJ 14900); stn E-510, 15°48.503'S, 38°35.265'W, 599m, 12/VI/2000, 1 ovig. 24.7mm (MNRJ 14895); stn E-517, 13°22.173'S, 38°36.566'W, 750m, 19/VI/2000, 5♂ 17.3-19.5mm, 2♀ 18.7, 19.1mm (MNRJ 14899).

Supplemental specimens – “Oregon”: stn 4300, off Suriname, 07°44'N, 54°19'W, 23/III/1963, 1 ovig. 24.9mm (paratype, RMNH 26965).

Diagnosis – Carapace and abdomen covered with short, dense pubescence. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface lacking transverse septa or corrugations. Carapace with first (submedian) carina composed of low, blunt tubercles; anteriormost tubercle of anterior second (intermediate) carina obsolete; anterior third (antennal) carina short, not extending to hepatic region; posterior third carina terminating anteriorly in blunt tubercle; anterior fourth (lateral) carina not forming acute lamina, armed with 2 spines (including terminal spine); antennal spine strong, far more strongly divergent than branchiostegal spine; few intercarinal tubercles on median and branchial regions. Abdomen with low, broad median carinae; dorsolateral carinae also low; tergal and pleural tubercles few, obsolete. Eye large (maximal diameter 0.28-0.30 of carapace length), darkly pigmented. Dactyli of fourth and fifth pereopods subspatulate, 0.60-0.70 times as long as propodus in fourth, 0.50-0.60 in fifth.

Variations – The development of the carinae on the carapace and abdomen is generally similar between males and females in this species.

Distribution – Previously known only from off north coast of South America between Tobago and French Guiana; at depths of 410-733m. The present material considerably extends the known geographical range of this species to south and east (21°48'S, 40°01'W).

Remarks – The present specimens agree well with the original description by HOLTHUIS (1971). One paratype (RMNH 6965) was also examined for comparison (see “Material examined”).

The densely pubescent carapace and abdomen and the possession of two spines on the anterior fourth (lateral) carina links this species to *G. spinicauda* A. Milne-Edwards, 1881, *G. haematonotus* Holthuis, 1871, and *G. longleyi* Schmitt, 1931. The elongate, strongly divergent antennal spine immediately separates *G. aurantiaca* from the latter three species. If the second spine on the anterior fourth carina is broken off, specimens may be misidentified with *G. alispina*. The blunt, rather than acuminate, anteriormost tubercle of the anterior second carina on the carapace and low, obsolete tubercles on the first carinae on the carapace will serve to distinguish *G. aurantiaca* from *G. alispina*.

Glyphocrangon longirostris (Smith, 1882)
(Fig. 2C, D)

Rhacocaris longirostris Smith, 1882:51, pl. 5, fig. 1, pl. 6, fig. 1 (type locality: off Cape Hatteras, North Carolina, U.S.A., 35°41.03'N, 74°31.00'W, 1885m).

Glyphocrangon longirostris - PEQUEGNAT, 1970:106; HOLTHUIS, 1971:330, figs. 11-13; CROSNIER & FOREST, 1973:230, fig. 73a, b; D'UDEKEM D'ACCOZ, 1999:138.

Material examined – R/V “Thalassa”: stn E-496, 13°17.580'S, 38°17.599'W, 1717m, 07/VI/2000, 3♀ 16.6-17.2mm, 4♀ 14.2-19.6mm, 4 ovig. 19.4-22.2mm, 1 juv. 8.0mm (MNRJ 14915); stn E-0509, 15°47.725'S, 38°21.973'W, 2076m, 12/VI/2000, 4♂ 14.3-18.0mm, 6♀ 17.2-21.2mm, 1 ovig. 21.8mm (MNRJ 14901); stn E-519, 13°19.944'S, 38°19.654'W, 1730m, 20/VI/2000, 1♂ 18.0mm (MNRJ 14916); stn E-520, 13°21.837'S, 38°16.683'W, 2137m, 20/VI/2000, 4♀ 13.0-21.7mm, 2 ovig. 19.2, 19.4mm (MNRJ 14916); stn E-525, 20°08.145'S, 38°38.081'W, 1639m, 28/VI/2000, 2♀ 18.9, 19.8mm (MNRJ

14911); stn E-526, 20°03.984'S, 38°40.502'W, 1637m, 28/VI/2000, 3♀ 12.3-16.9mm, 1 ovig. 22.0mm, 1♂ 15.2mm (MNRJ 14911); stn E-527, 19°50.736'S, 39°10.817'W, 1402m, 29/VI/2000, 1♂ 16.7mm, 1♀ 19.0mm (MNRJ 14908); stn E-537, 20°26.850'S, 39°41.636'W, 1545m, 02/VII/2000, 1♀ 16.0mm (MNRJ 14916); stn E-538, 20°27.677'S, 39°38.101'W, 1680m, 02/VII/2000, 2♂ 14.7, 18.7mm (MNRJ 14916); stn E-549, 21°25.738'S, 39°43.946'W, 1718m, 07/VII/2000, 3 ovig. 20.8-30.3mm (MNRJ 14904); stn E-550, 21°26.324'S, 39°49.113'W, 1598m, 07/VII/2000,

1 ovig. 23.7mm (MNRJ 14903); stn E-552, 21°07.493'S, 39°46.423'W, 1694m, 08/VII/2000: 2♂ 20.2, 22.0mm, 2♀ 16.4, 24.6mm, 1 ovig. 24.8mm (MNRJ 14914).

Supplemental specimens – “Pillsbury”: stn 309, off Nigeria, West Africa, 04°15'N, 04°27'E, 1280-1320m, 26/V/1965, 1♂ 18.7mm, 2♀ 18.3, 21.1mm, 7 ovig. 21.1-27.1mm (RMNH 26584).

Diagnosis – Carapace and abdomen naked. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface with

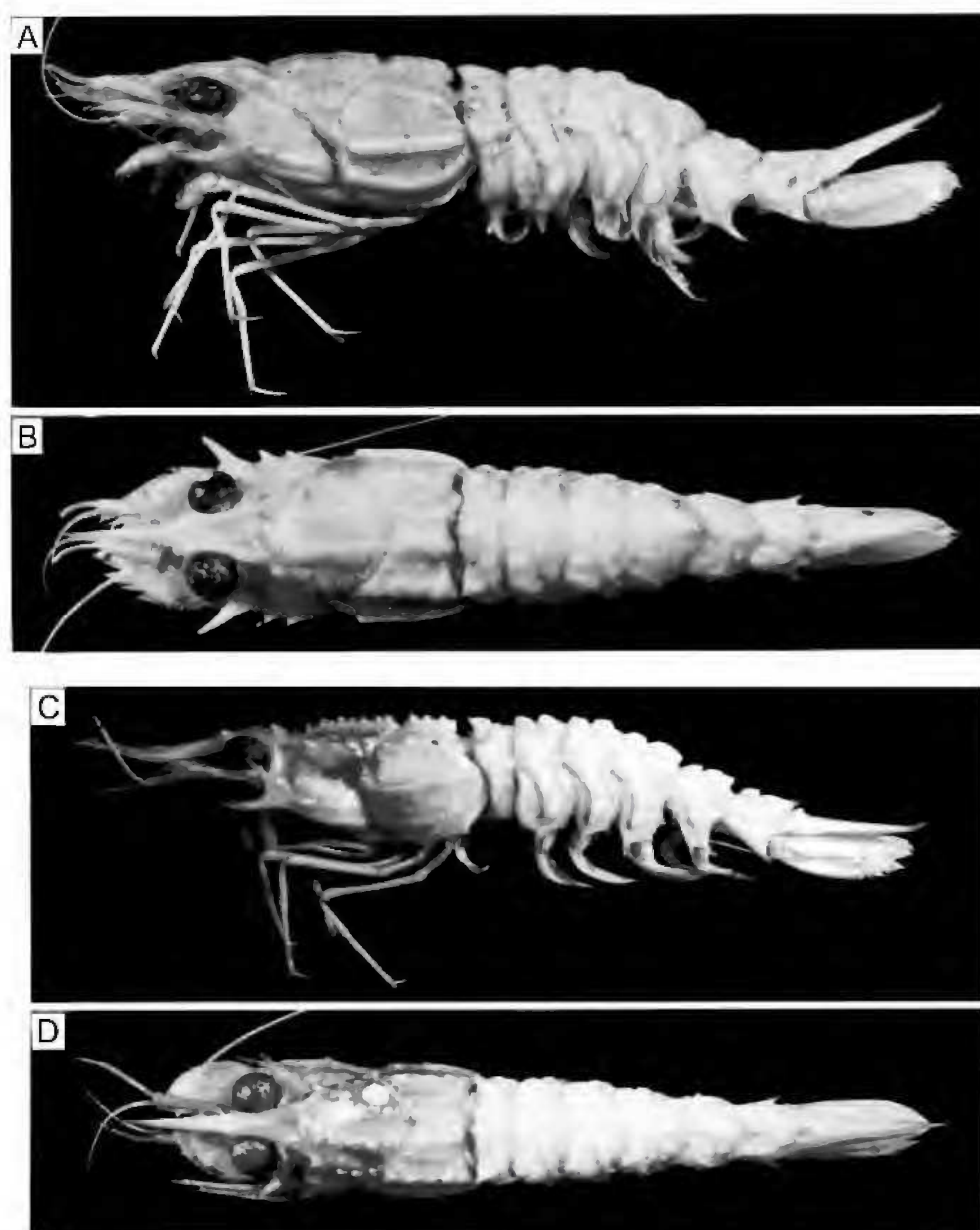


Fig.2- (A, B) *Glyphocrangon aurantiaca* Holthuis, 1971, habitus (lateral and dorsal views), ovigerous female (cl 24.7 mm; MNRJ 14895); (C, D) *Glyphocrangon longirostris* (Smith, 1882), habitus (lateral and dorsal views), ovigerous female (cl 21.8mm; MNRJ 14915).

corrugations. Carapace with first (submedian) carina composed of small, acute or subacute tubercles; anteriormost tubercle of anterior second (intermediate) carina spiniform; anterior third (antennal) carina short, not extending to hepatic region; posterior third carina terminating anteriorly in low, right angle; anterior fourth (lateral) carina not expanded, not aligned with anterior third carina, terminating in small spine, but otherwise unarmed; antennal spine strong, usually more strongly divergent than branchiostegal spine; few intercarinal tubercles on median and branchial regions. Abdomen with relatively high median carinae in females; dorsolateral carinae low, but distinct: tergal and pleural tubercles low, but distinct in females. Eye moderately large (maximal diameter 0.23-0.25 of carapace length), darkly pigmented in adults, pale in young specimens. Dactyli of fourth and fifth pereopods subspatulate, 0.30-0.40 times as long as propodus in fourth, 0.25-0.35 in fifth.

Variations – Possible sexual dimorphism is found in the development of the carinae and tubercles on the carapace and abdomen. The anterior first carina on the carapace and median carinae on the abdomen are lower in males than in females. The abdominal tubercles are also less conspicuous in males than in females.

Distribution – As HOLTHUIS (1971) summarized, this species has a wide distribution in the Atlantic Ocean: from east of Massachusetts, U.S.A. to off Suriname in the western Atlantic; from southwest of Ireland to Cape Point, South Africa in the eastern Atlantic; at depths of 1280-2500m. In spite of the known wide geographical distribution, there has been no record of *G. longirostris* from Brazilian waters before this study.

Remarks – The present specimens agree well with the extensive account of *G. longirostris* by HOLTHUIS (1971). The specimens from off Nigeria, West Africa, used by HOLTHUIS (1971), were also examined (RMNH 26584; see material examined) for comparison. The specimens from the two distant localities are very similar, and there is little doubt that they represent the same species.

This species is similar to *G. nobilis* and *G. alispina* in the anterior fourth (lateral) carina on the carapace armed only with a terminal spine. The naked body and the presence of corrugations on the dorsal surface of the rostrum immediately distinguish *G. longirostris* from the latter two species. Further, the anterior fourth carina of *G.*

longirostris is only slightly oblique, and thus it is not aligned with the anterior third carina. In *G. nobilis* and *G. alispina*, the anterior fourth carina is strongly oblique and nearly aligned with the anterior third carina.

Glyphocrangon neglecta Faxon, 1896
(Fig. 3A, B)

Glyphocrangon neglecta Faxon, 1896:159, pl.1, figs.5, 6 (type locality: off Grenada, 12°03.3'N, 61°47.1'W, 524m); HOLTHUIS, 1971:319, fig.9; TAKEDA & OKUTANI, 1983:69, unnumbered fig.

Material examined – R/V “Thalassa”: stn D-464, 21°48.496'S, 40°01.539'W, 592-618m, 22/VI/1999, 1♂ 13.1mm, 1♀ 13.1mm, 1 ovig. 16.7mm (MNRJ 14087); stn E-510, 15°48.503'S, 38°35.265'W, 599m, 12/VI/2000, 4♀ 9.7-13.5mm, 2 juv. 8.2, 8.2mm (MNRJ 14895); stn E-511, 15°42.675'S, 38°37.298'W, 251m, 12/VI/2000, 1♀ 9.7mm (MNRJ 14890); stn E-519, 13°19.944'S, 38°19.654'W, 1730m, 20/VI/2000, 1 ovig. 15.6mm (MNRJ 14916); stn D-538, 13°40.741'S, 38°71.601'W, 450-500m, 07/VII/1999, 39♂ 10.4-13.0mm, 110♀ 9.2-12.4mm, 110 ovig. 12.3-16.0mm, 1 juv. 8.0mm (MNRJ 14088); stn E-518, 13°21.199'S, 38°38.896'W, 518m, 10♂ 11.0-14.9mm, 10♀ 11.4-13.1mm, 35♀ 13.6-15.8mm (MNRJ 14894); stn E-521, 13°27.306'S, 38°43.286'W, 376m, 21/VI/2000, 2♂ 13.5, 13.7mm, 2♀ 9.7, 10.1mm (MNRJ 14893).

Supplemental specimens – “Pillsbury”: stn 776, Caribbean Sea off Colombia, 12°13.3'N, 72°50.0'W, 408-576m, 29/VII/1968, 17♂ 11.7-16.7mm, 12♀ 10.3-17.1mm, 17 ovig. 14.1-16.8mm (RMNH 25476).

Diagnosis – Carapace and abdomen naked. Rostrum longer than carapace, with 2 pairs of lateral spines; dorsal surface corrugate with reticulate pattern of ridges. Carapace with low, entire or slightly lobate first (submedian) carinae; anteriormost tubercle of anterior second (intermediate) carina obsolete; anterior third (antennal) carina extending to posterior part of hepatic region; posterior third carina terminating anteriorly in low, right angle; anterior fourth (lateral) carina not expanded, continuous with branchiostegal spine, unarmed; antennal spine strong, somewhat divergent; no intercarinal tubercles on median and branchial regions. Abdomen with low median carinae (those on second, third and anterior section of fourth somites faint or absent); dorsolateral carinae on

second to fourth somites faint or absent: no tergal and pleural tubercles. Eye large (maximal diameter 0.25-0.28 of carapace length), darkly pigmented. Dactyli of fourth and fifth pereopods subspatulate, 0.55-0.65 times as long as propodus in fourth, 0.40-0.50 in fifth.

Variations – The development of the carinae on the carapace and abdomen is similar between males and females.

Distribution – This species was known with certainty only from the southern Caribbean and

along the north coast of South America (from Panama to Surinam); at depths of 365-1050m (HOLTHUIS, 1971). The occurrence of *G. neglecta* from Brazilian waters was mentioned by RAMOS-PORTO & SILVA (1998) and MUNIZ *et al.* (2002), although papers have not been published.

Remarks – The present specimens agree well with the account of HOLTHUIS (1971) and the supplemental specimens from off Colombia used by HOLTHUIS (1971). This species is distinctive among the Atlantic species of *Glyphocrangon* in

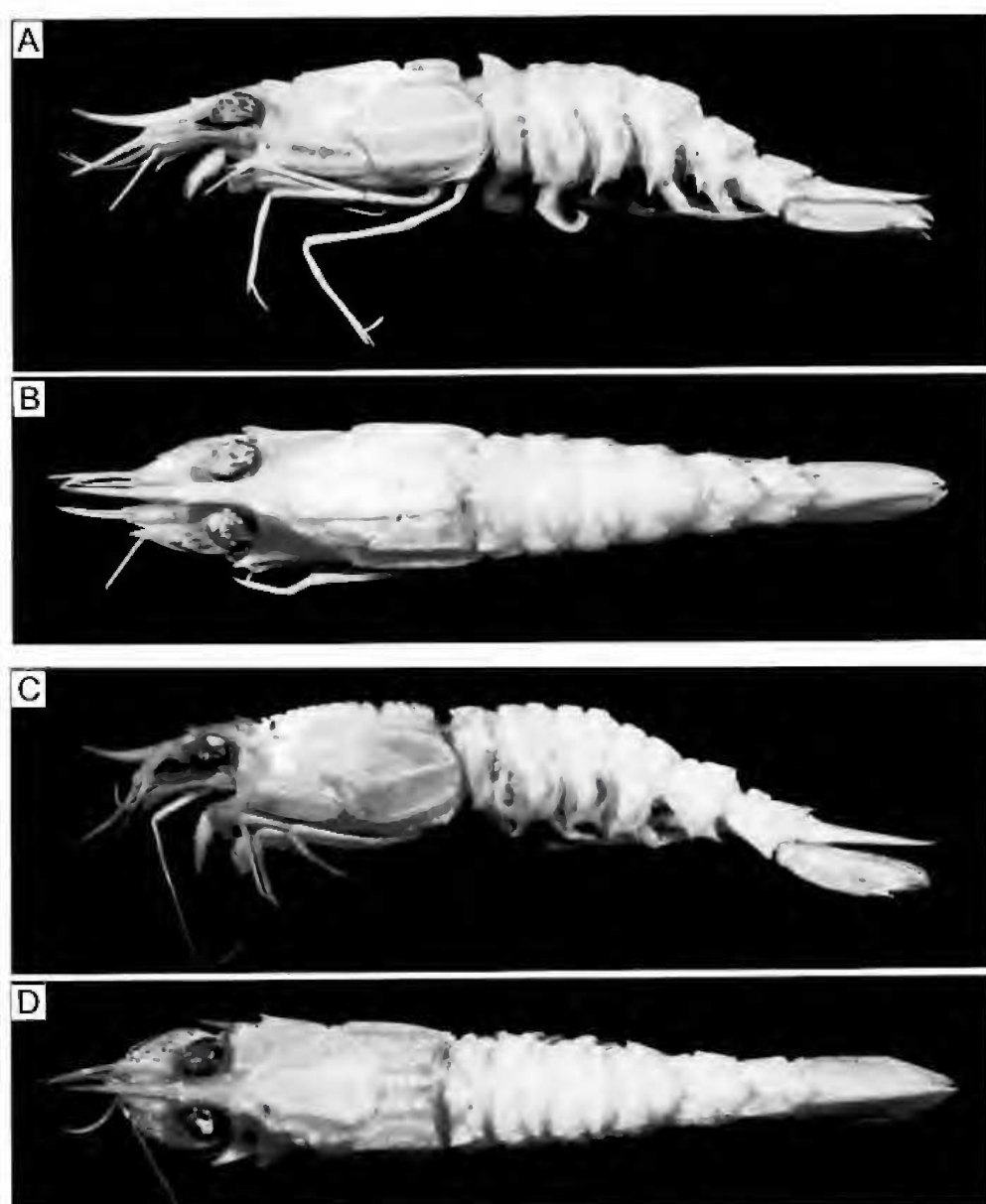


Fig.3- (A, B) *Glyphocrangon neglecta* Faxon, 1896, habitus (lateral and dorsal views), ovigerous female (cl 16.7mm; MNRJ 14087); (C, D) *Glyphocrangon nobilis* A. Milne Edwards, 1881, habitus (lateral and dorsal views), ovigerous female (cl 16.0mm; MNRJ 18919).

the fully developed anterior third (antennal) carina on the carapace, which extends to the posterior part of the hepatic region, and the rostrum being longer than the carapace.

Glyphocrangon nobilis A.Milne-Edwards, 1881
(Fig.3C, D)

Glyphocrangon nobile A.Milne-Edwards, 1881:5
(type locality: off Dominica, 15°26.36'N, 61°36.45'W, 2036m); 1883, pl.40, fig.2, 2a; PEQUEGNAT, 1970:107.

Glyphocrangon nobilis - HOLTHUIS, 1971:341, fig.14;
FOREST & HOLTHUIS, 1997:56, pl.40, fig.2, 2a.

Material examined – R/V “Thalassa”: stn E-506, 14°36.579'S, 38°49.544'W, 1067m, 10/VI/2000, 2 ovig. 14.4, 16.0mm (MNRJ 18919); stn E-0522, 13°30.495'S, 38°38.977'W, 1144m, 21/VI/2000, 1 ovig. 14.9mm (MNRJ 18920); same data, 3 ovig. 18.1-18.3 mm (MNRJ 14907).

Supplemental specimens – “Iselin”: stn 58, Bahama, 24°14'N, 77°17'W, 1390m, 27/II/1973, 5♀ 11.9-14.3mm, 5 ovig. 14.9-16.0mm (NNM 29495).

Diagnosis – Carapace and abdomen covered with short, dense pubescence. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface without transverse septa or corrugation. Carapace with first (submedian) carina composed of low, subacute or acute tubercles; anteriormost tubercle of anterior second (intermediate) carina spiniform; anterior third (antennal) carina short, not extending to hepatic region; posterior third carina terminating anteriorly in small spine or low, right angle; anterior fourth (lateral) carina not expanded, nearly aligned with anterior third carina, terminating in small spine far remote from anterolateral margin of carapace, otherwise unarmed; antennal spine strong, slightly to strongly divergent than branchiostegal spine; no conspicuous intercarinal tubercles on median and branchial regions. Abdomen with low, broad median carinae; dorsolateral carinae also low: tergal and pleural tubercles few, obsolete. Eye moderately large (maximal diameter 0.20-0.23 of carapace length), darkly pigmented. Dactyli of fourth and fifth pereopods subspatulate, 0.45-0.50 times as long as propodus in fourth, 0.30-0.40 in fifth.

Distribution – This species has been recorded from South Carolina (U.S.A) and the Bahama Islands south to Suriname, including the greater

part of the West Indian area; at depths of 410-2150m (HOLTHUIS, 1971).

Remarks – The present specimens from Brazil agree well with the detailed account of *G. nobilis* by HOLTHUIS (1971). Differences between *G. nobilis* and *G. alispina* are discussed under account of the latter species.

The status of the type material of *G. nobilis* is discussed by FOREST & HOLTHUIS (1997).

Glyphocrangon sculpta (Smith, 1882)
(Fig.4A, B)

Rhachocaris sculpta Smith, 1882:49, pl.5, fig.3, pl.6, fig.3-3d (type locality: off Delaware, U.S.A., 38°16.45'N, 73°10.30'W).

Glyphocrangon sculptus - SMITH, 1886:608, 655, pl.8, fig.3, pl.9, figs.1, 2.

(?) *Glyphocrangon sculptus* - PEQUEGNAT, 1970:109.

Glyphocrangon sculpta - HOLTHUIS, 1971:279, figs.2, 3.

Material examined – R/V “Thalassa”: stn E-520, 13°21.837'S, 38°16.683'W, 2137m, 1♀ 22.5mm (MNRJ 14889); stn E-549, 21°25.738'S, 39°43.946'W, 1718m, 07/VII/2000, 1 ovig. 22.8mm (MNRJ 18921).

Supplemental specimens – “Iselin”: stn 93, Bahama, 24°24.8'N, 76°11.4'W, 1757m, 13/II/1974, 1 ovig. 19.4mm (RMNH 29854); stn 187, Bahama, 23°59.5'N, 75°49.0'W, 1880m, 12/II/1974, 1♀ 15.6mm (RMNH 29859); stn 177, Bahama, 24°22.9'N, 76°08.9'W, 1767m, 2♀ 12.5, 17.3mm (RMNH 29858).

Diagnosis – Carapace and abdomen naked or with sparse, minute setae. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface without transverse septa or corrugation. Carapace with first (submedian) carina composed of small spines; anteriormost tubercle of anterior second (intermediate) carina strong, dentate; anterior third (antennal) carina confined to antennal spine; posterior third carina terminating in small spine; anterior fourth (lateral) carina divided in two sections each terminating in large spine; antennal spine strong, slightly to strongly divergent than branchiostegal spine; numerous small spiniform tubercles on median and branchial regions. Abdomen with high, strongly compressed median carinae; dorsolateral carinae also high, strongly compressed laterally: tergal and pleural tubercles numerous, spiniform. Eye moderately large (maximal diameter 0.20-0.23 of carapace length), darkly pigmented. Dactyli of

fourth and fifth pereopods subcylindrical, distally bifid in adult females.

Variations – In the original description, Smith (1882) described that the dactyli of the fourth and fifth pereopods as bifid. BARNARD (1950) pointed out correctly that this feature is only shown by females, while in males the dactyli are of the usual oval shape, at most with a slight additional hump in the distal part of lateral margin (HOLTHUIS, 1971). It has been found that the shape of the dactyli in females varies with increase of the size of animals. In the small specimens (cl 12.5, 15.6mm), the dactyli terminate simple, acuminate unguis, while in large specimens (cl 17.3-22.8mm) the dactyli are bifid.

Distribution – This species has a wide distribution in the Atlantic Ocean: from off the east coast of U.S.A. between Massachusetts and Delaware to West Indies in the western Atlantic; from Iceland to South Africa in the eastern Atlantic; at depths of 1645-3219m (HOLTHUIS, 1971). However, the records from South Africa (STEBBING, 1908, 1910; BARNARD, 1950; KENSLEY 1968) are questionable (see remarks).

Remarks - The present specimens agree well with the description by HOLTHUIS (1971) and the supplemental specimens from Bahama. Differences between males and females were not evaluated during this study, as no male specimens were available for examination.

HOLTHUIS (1971) mentioned that the presence of three pleural teeth on the fifth abdominal somite was constant in *G. sculpta*. However, PEQUEGNAT (1970) and KOMAI (in press) demonstrated that the development of the third tooth on the posterior pleural margin is considerably variable in this species. Therefore, the number of the pleural teeth is not reliable in diagnosing *G. sculpta*. Nevertheless, this species is quite distinctive among the Atlantic members of the genus in the combination of the spinulose carapace and abdomen, distinctly bi-dentate anterior fourth (lateral) carina and subcylindrical dactyli of the fourth and fifth pereopod. The closest relative of *G. sculpta* is perhaps *G. podager* Bate, 1888, known only by the holotype from the southwestern Indian Ocean (KOMAI, in press). Differences between *G. sculpta* and *G. podager* were discussed by KOMAI (in press).

During this study, two specimens from South Africa referred to *G. sculpta* by Kensley (1968) have been preliminary examined. The South African specimens are different from the western Atlantic

specimens in having a covering of numerous short setae on the carapace and abdomen. The difference may suggest that the South African specimens represent a separate species, as the setation on the body is constant in other species of *Glyphocrangon* (KOMAI, in press). In order to assess satisfactorily the taxonomic status of the South African population, however, it is necessary to compare more specimens.

Glyphocrangon spinicauda A.Milne-Edwards, 1881 (Fig.4C, D)

Glyphocrangon spinicauda A.Milne Edwards, 1881:3 (type locality: off St. Christopher, West Indies, 17°19.27'S, 62°50.30'W, 450m); 1883, pl.40, fig.1, 1a; PEQUEGNAT, 1970:110; HOLTHUIS, 1971:295, figs.6-7; COELHO & RAMOS, 1972:157; RAMOS-PORTO & COELHO, 1998:342; FOREST & HOLTHUIS, 1997:56, pl.40, fig.1, 1a.

Material examined – R/V “Thalassa”: stn E-502, 14°28.385'S, 38°52.395'W, 522m, 09/VI/2000, 9♀ 11.3-18.7mm (MNRJ 14888); stn E-507, 15°08.595'S, 38°40.638'W, 1026m, 11/VI/2000, 1♀ (damaged) (MNRJ 14898); stn E-509, 15°47.725'S, 38°21.973'W, 2076m, 12/VI/2000, 1♀ (damaged) (MNRJ 14897).

Supplemental specimens – “Gerda”: stn 885, Gulf of Mexico, 21°10'N, 86°28'W, 9/IX/1967, 1♂ 19.4mm, 1♀ 16.2mm, 2 ovig. 18.2, 21.7mm (RMNH 25474).

Diagnosis – Carapace and abdomen covered with very short, dense pubescence. Rostrum shorter than carapace in adult, with 2 pairs of lateral spines; dorsal surface lacking transverse septa or corrugations. Carapace with first (submedian) carina composed of blunt tubercles; anteriormost tubercle of anterior second (intermediate) carina small, usually blunt; trace of anterior third (antennal) carina on hepatic region represented by row of small, low tubercles; posterior third carina terminating anteriorly in low, light angle; anterior fourth (lateral) carina not expanded, armed with 2 spines (including terminal spine); antennal spine moderately strong, directed forward; some intercarinal tubercles on median and branchial regions. Abdomen with moderately high, somewhat compressed median carinae; dorsolateral carinae also moderately high; tergal and pleural tubercles conspicuous. Eye moderately large (maximal diameter 0.20-0.23 of carapace length), darkly pigmented. Dactyli of fourth and

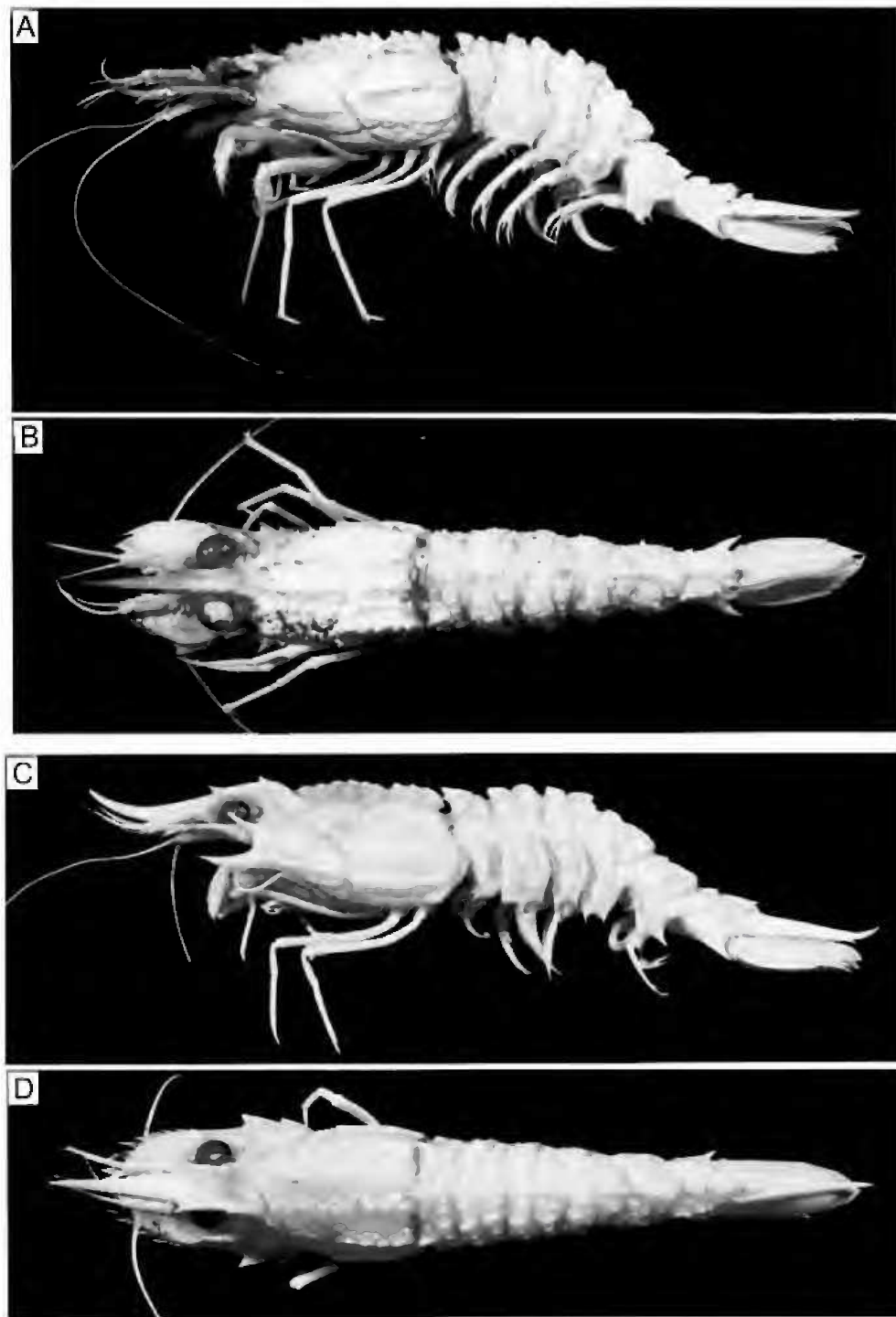


Fig.4- (A, B) *Glyphocrangon sculpta* (Smith, 1882), habitus (lateral and dorsal views), female (cl 22.5mm; MNRJ 14889); (C, D) *Glyphocrangon spinicauda* A. Milne-Edwards, 1881, habitus (lateral and dorsal views), ovigerous female (cl 16.7mm; MNRJ 14888).

fifth pereopods subspatulate, 0.40-0.50 times as long as propodus in fourth, 0.35-0.40 in fifth.

Distribution – This species has been recorded from the western Atlantic from the east coast of Florida south to Barbados and in the Caribbean area as

far west as Yucatan, Honduras and Nicaragua; at depths of 256-692m (HOLTHUIS, 1971). The occurrence of *G. spinicauda* from Brazilian waters was mentioned by RAMOS-PORTO & SILVA (1998), although a paper has not been

published. This study confirms the occurrence of this species in Brazil.

Remarks – The present specimens agree well with the detailed description by HOLTHUIS (1971) and the supplemental specimens from the Gulf of Mexico. As indicated by HOLTHUIS (1971), *G. spinicauda* resembles *G. aurantiaca*, *G. haematonotus* and *G. longleyi*. The anterior third carina represented by a row of small, low tubercles on the hepatic region and the conspicuous tergal and pleural tubercles on the abdomen distinguish *G. spinicauda* from the latter three species.

In the key to the species of *Glyphocrangon* known at that time, CHACE (1983) stated that the posterior third carina on the carapace was dentate anteriorly in *G. spinicauda*. In fact, however, that carina terminates in a blunt point in this species.

The status of the type material of *G. spinicauda* is discussed by FOREST & HOLTHUIS (1997).

DISCUSSION

Thanks to the excellent study by HOLTHUIS (1971), the taxonomy of the Atlantic species of *Glyphocrangon* is well established. In addition to the eight species herein recorded from the southwestern Atlantic, other four species are known from the Atlantic: *G. atlantica* Chace, 1939, *G. haematonotus* Holthuis, 1971, *G. longleyi* Schmitt, 1931 and *G. rimapes* Bate, 1888. Of them, *G. rimapes* has been reported from the northeastern Atlantic off Ireland at depths of 3022-4104m (RICE, 1981) and southwestern Atlantic off Argentina at depth of 3138m (BATE, 1888). Therefore, future investigation of bathyal zone at depths greater than 3000m may eventually reveal the existence of this rare species off the Brazilian coast. Other three species are known from the Gulf of Mexico as well as the eight species occurring in Brazilian waters, and therefore it is not surprising if they are discovered in Brazilian waters.

It is interesting to note that the Atlantic species of *Glyphocrangon* are not highly localized. Three species, *G. atlantica*, *G. longirostris*, and *G. sculpta* are widely distributed in western and northeastern Atlantic (HOLTHUIS, 1971); of them, *G. longirostris* and *G. sculpta* extend the geographical ranges to the southeastern Atlantic off west coast of Africa (CROSNIER & FOREST, 1973).

The other eight species (*G. aculeata*, *G. alispina*, *G. aurantiaca*, *G. haematonotus*, *G. longleyi*, *G. neglecta*, *G. nobilis* and *G. spinicauda*) are confined to the western Atlantic, although three species, *G. aculeata*, *G. longirostris* and *G. sculpta*, are longitudinally widely distributed from east coast of United States to Brazil. In contrast, KOMAI (in press) showed that Indo-West Pacific species of the genus are highly localized. The lack of high degree of endemism in the Atlantic species of *Glyphocrangon* may be explained by the existence of the Gulf Stream which enables the wide-spread dispersal of larvae.

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